

# **EPA Superfund Preliminary Assessment/Site Inspection:**

**PATRICK BAYOU  
EPA ID: TX0000605329  
Mar-00  
DEER PARK, TX**

This document is a combined report of both the Preliminary Assessment and Site Inspection activities.

# **Screening Site Inspection Work Plan**

**Patrick Bayou  
Deer Park, Harris County, Texas  
TXO 000 605 329**

REGION VI

Prepared in cooperation with the  
U.S. Environmental Protection Agency

March 2000

PRELIMINARY ASSESSMENT/  
SCREENING SITE INSPECTION WORK PLAN

Patrick Bayou

Deer Park, Texas

TXD Pending

SIGNATURE PAGE

James D. Thompson  
Texas Natural Resource Conservation Commission  
Site Investigation Manager

John Syer  
Texas Natural Resource Conservation Commission  
PA/SI Program Health and Safety Officer

Allan M. Seils  
Texas Natural Resource Conservation Commission  
PAJSI Program Manager

Wesley G. Newberry  
Texas Natural Resource Conservation Commission  
PAJSI Program Technical Director

William Rhotenberry  
U.S. Environmental Protection Agency

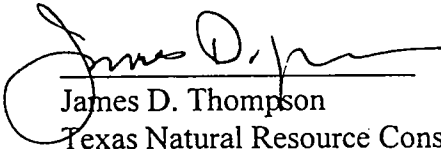
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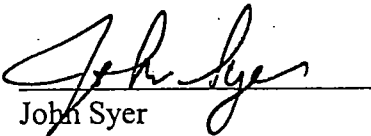
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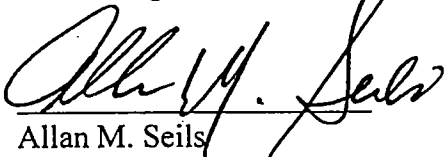
James D. Thompson  
Texas Natural Resource Conservation Commission  
Site Investigation Manager

3/20/00  
Date



John Syer  
Texas Natural Resource Conservation Commission  
PA/SI Program Health and Safety Officer

3/20/00  
Date



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Texas Natural Resource Conservation Commission  
PA/SI Program Manager

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\_\_\_\_\_  
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**Preliminary Assessment/  
Screening Site Inspection Work Plan**

**Patrick Bayou  
Deer Park, Texas  
TXD Pending**

**Prepared in cooperation with the  
Texas Natural Resource Conservation Commission  
and  
U.S. Environmental Protection Agency**

Prepared by

Texas Natural Resource Conservation Commission  
Site Assessment and Management Section  
Site Discovery and Assessment Program  
Site Investigation Manager - J. D. Thompson  
Austin, Texas

March 2000

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#### NOTE

The State predecessor agencies: Texas Water Quality Board (TWQB), Texas Department of Water Resources (TDWR), Texas Water Commission (TWC), and Texas Air Control Board (TACB), referred to throughout this report are now known as the Texas Natural Resource Conservation Commission (TNRCC). The new agency, TNRCC, became effective September 1, 1993, as mandated under State. Senate Bill 2 of the 73<sup>rd</sup> Regular Legislative Session.

## SECTION I

### INTRODUCTION

The Texas Natural Resource Conservation Commission (TNRCC) has been requested by the U.S. Environmental Protection Agency (EPA) Region VI to conduct a Preliminary Assessment/Screening Site Inspection (PA/SSI) at the Patrick Bayou (PB) site (EPA Identification' No. TXD Pending; TNRCC Solid Waste Registration (SWR) No. None) located south of the Houston Ship Channel (HSC) and north of Deer Park, Texas, Harris County. The site is located along the property boundaries of three petrochemical industries that discharge treated clarifier wastes and cooling tower wastewater under permit into the bayou. In addition, Patrick Bayou receives effluent discharges from the City of Deer Park wastewater treatment plant (WWTP) and discharges from an air separation plant located along the East Fork tributary. Prior investigations conducted by the City of Houston in 1993 and 1994 along the HSC and its tributaries indicated high to moderate levels of DDD, DDT, polynuclear aromatic hydrocarbons (PAHs), cadmium, chromium, mercury, nickel, zinc, polychlorinated biphenyls (PCBs) and dioxin accumulating in Patrick Bayou. These investigations were based on sediment samples collected from three routine HSC ambient stream monitoring locations (Stations 014, 015 and 016) located within Patrick Bayou (ref 5, pg 1). Subsequent investigations in July 1994 during a joint-TNRCC/TJ SEPA Ambient Toxicity and Water and Sediment Quality Survey using sediment sample results collected from 10 sample locations selected along Patrick Bayou revealed moderate heavy metals, elevated petroleum hydrocarbon contamination and PCBs accumulating within the bayou requiring further investigation (ref 5, pgs 1-2, 4 and 6-8).

The "site" consists of a small bayou tributary influenced by tidal action from Galveston Bay and the HSC. Patrick Bayou begins at the end of a series of concrete/gunite-lined storm water discharge channels/culverts for the City of Deer Park, Texas draining north to the HSC approximately 2.1 miles as measured from the State Highway (SH) 225 bridge (ref 5, pg 3). The bayou is approximately 600 feet wide within the last 0.25 mile before entering the HSC and is nearly 500 feet wide at its widest point adjacent to the OxyVinyls, LP chemical plant. The bayou contains wetland vegetation and is a natural habitat for waterfowl. A significant population of nektonic species has been documented near the mouth of Patrick Bayou (ref 5, pg 5). Human consumption of blue crabs and catfish along the HSC has been restricted by the Texas Department of Health for high levels of dioxin reportedly originating from discharged pulp mill wastes. A fish kill of 101-1,000 was reported on March 21, 1990 in the East Fork Patrick Bayou and a second fish kill of 1,060 was reported on September 10, 1990 in Patrick Bayou between the OxyVinyl, LP and Shell Refining plants from unknown causes (ref 8, pg 698).

This SSI will focus on previously identified areas where sediment samples have indicated moderate to high levels of organic heavy metal, pesticide and PCB, concentrations determined during the July 26, 1994 joint-TNRCC Region 12/USEPA sampling event. In addition, historical levels of contamination that have been documented from a series of TNRCC routine stream monitoring station sampling events will be evaluated. These areas include several industrial outfalls located along Patrick Bayou and the East Fork tributary as well as locations downstream from the City of Deer Park WWTP discharge

point. These areas of interest include:

- (1) the OxyVinyls, LP Outfalls No. 003, 002 and 001 (Permit No. 00305) located approximately 0.4 mi., 0.6 mi. and 0.85 mi. respectively south of the bayou's convergence with the Houston Ship Channel;
- (2) the Shell Refinery and Shell Chemical Company Outfalls No. ROO I and COO I (Permits No. 00403 and 00402) both located approximately 1.5 mi. south of the convergence with the HSC;
- (3) the Lubrizol Corporation Outfall No. 001 (Permit No. 00639) located approximately 1.8 mi. south of the convergence with the HSC;
- (4) the City of Deer Park WWTP discharge point (Permit No. 10519) located approximately 2.3 mi. south of the convergence with the HSC; and finally,
- (5) the Praxair discharge point (Permit No. 01173) that discharges to a drainage channel along a railroad track and then to the East Fork of Patrick Bayou entering Patrick Bayou at approximately 1.13 mi. south of the convergence with the HSC.

The primary contaminants of concern include pesticides, polynuclear aromatic hydrocarbons (PAHs), heavy metals, PCBs and dioxin that may have originated from industrial wastewater discharge outfalls, storm water runoff discharge points and/or municipal wastewater discharging to the bayou. These discharge areas will be investigated and sampled during the SSI to further characterize accumulating hazardous substances and determine the extend of contaminant migration. In addition, unaffected background levels for the contaminants of concern will be obtained by collecting representative sediment samples.

The primary constituents of concern include: two pesticides DDD, DDT; sixteen PAHs acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, 2-methylnaphthalene, phenanthrene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(123cd)pyrene and pyrene; three chlorinated hydrocarbons hexachlorobenzene (HCB), hexachlorobutadiene (HCBd) and hexachloroethane (HCE); seven semivolatile organic compounds bis(2ethylhexyl)phthalate, carbazole, dibenzofuran, 1,3-dichlorobenzene, 1,4-dichlorobenzene, di-n-butylphthalate, and 1,2,4-trichlorobenzene; nine priority pollutant metals arsenic, chromium, copper, lead, manganese, mercury, nickel, selenium and zinc; one PCB Aroclor 1248, and dioxin.

This work plan was prepared to describe the reconnaissance and sampling activities which are planned on and around the area of the Patrick Bayou Site to determine if further action is required as described below.

## **WORK PLAN OVERVIEW**

The purpose of this investigation is to document the release(s) or potential release(s) of hazardous substances from identifiable sources which may have migrated off-site. This work plan was



developed using available information obtained primarily through a review of TNRCC Central Office files located in Austin, Texas, TNRCC Region 12 and Region 4 files located in Houston and Arlington, Texas and a review of the TNRCC/USEPA Containment Assessment of Patrick Bayou report dated December 1996. The information collected from the review of records was evaluated for data gaps and additional information needs were incorporated into the work plan. This plan will be modified as necessary based on actual site conditions encountered.

Section I is the introduction, Section 2 is the site background and description and Section 3 describes the field work to be conducted. The TNRCC/USEPA Containment Assessment of Patrick Bayou report narrative, Supplemental Maps, Patrick Bayou Site Health and Safety Plan, TNRCC FY 2000-2001 Quality Assurance Project Plan (QAPP) document and the Site Reconnaissance Checklist are presented as appendices A through E, respectively.

### **SITE OBJECTIVE WITH RESPECT TO THE PREREMEDIAL PROCESS**

The preremedial stage of the Superfund process involves a PA and a site inspection (SI) stage consisting of a SSI and, if necessary, a listing site inspection (LSI). This PA/SSI is being conducted to determine if the Patrick Bayou Site is eligible for proposal to the National Priorities List (NPL) under the Federal Superfund Program. The PA/SSI will concentrate on assessing on-site sources and threats along the surface water exposure pathway.

A TNRCC/USEPA containment assessment report has already been completed identifying specific areas within Patrick Bayou requiring further investigation. This PA/SSI will build upon existing data by obtaining additional background information relevant to the Patrick Bayou Site through a file review and collecting environmental samples to further characterize conditions at the site. Sampling conducted during the field work will attempt to document hazardous substance migration to and from the Patrick Bayou Site from potential sources and look for evidence of actual human and environmental exposure to contaminants.

## **PROJECT CONTACTS**

EPA:

Bill Rhotenberry  
Environmental Protection Specialist  
U.S. Environmental Protection Agency, Region VI  
Superfund Site Assessment Section  
1445 Ross Avenue, Suite 1200  
Dallas, Texas 75202-2733  
(214) 665-8372

TNRCC: Wesley G. Newberry, Technical Director  
(512) 239-2512  
Allan M. Seils, PA/SI Program Manager  
(512) 239-2514  
James D. Thompson, Site Investigation Manager  
(817) 469-6750  
John Syer, Health and Safety Officer  
(512) 239-4136

Texas Natural Resource Conservation Commission  
Remediation Division  
Site Assessment and Management Section  
P.O. Box 13087, MC 142, Capitol Station  
Austin, Texas 78711  
(512) 239-2514

## **SITE CONTACTS**

Ted Brenneman, Environmental Manager  
OxyVinyls, LP  
P.O. Box 500, 1000 Tidal Road  
Deer Park, Texas 77536  
(281) 476-2692 FAX (281) 476-2149

William Carll, Environmental Affairs Manager  
Lubrizol Corporation  
P.O. Box 158, 41 Tidal Road  
Deer Park, Texas 77536-0158  
(281) 479-2851 FAX (281) 884-5308

Janice Wendel, Staff Environmental Specialist  
Shell Chemical Company  
P.O. Box 100, 5900 SH 225, ECB Annex B15  
Deer Park, Texas 77536  
(713) 246-1068 FAX (713) 246-6707

## **SECTION 2**

### **SITE BACKGROUND AND DESCRIPTION**

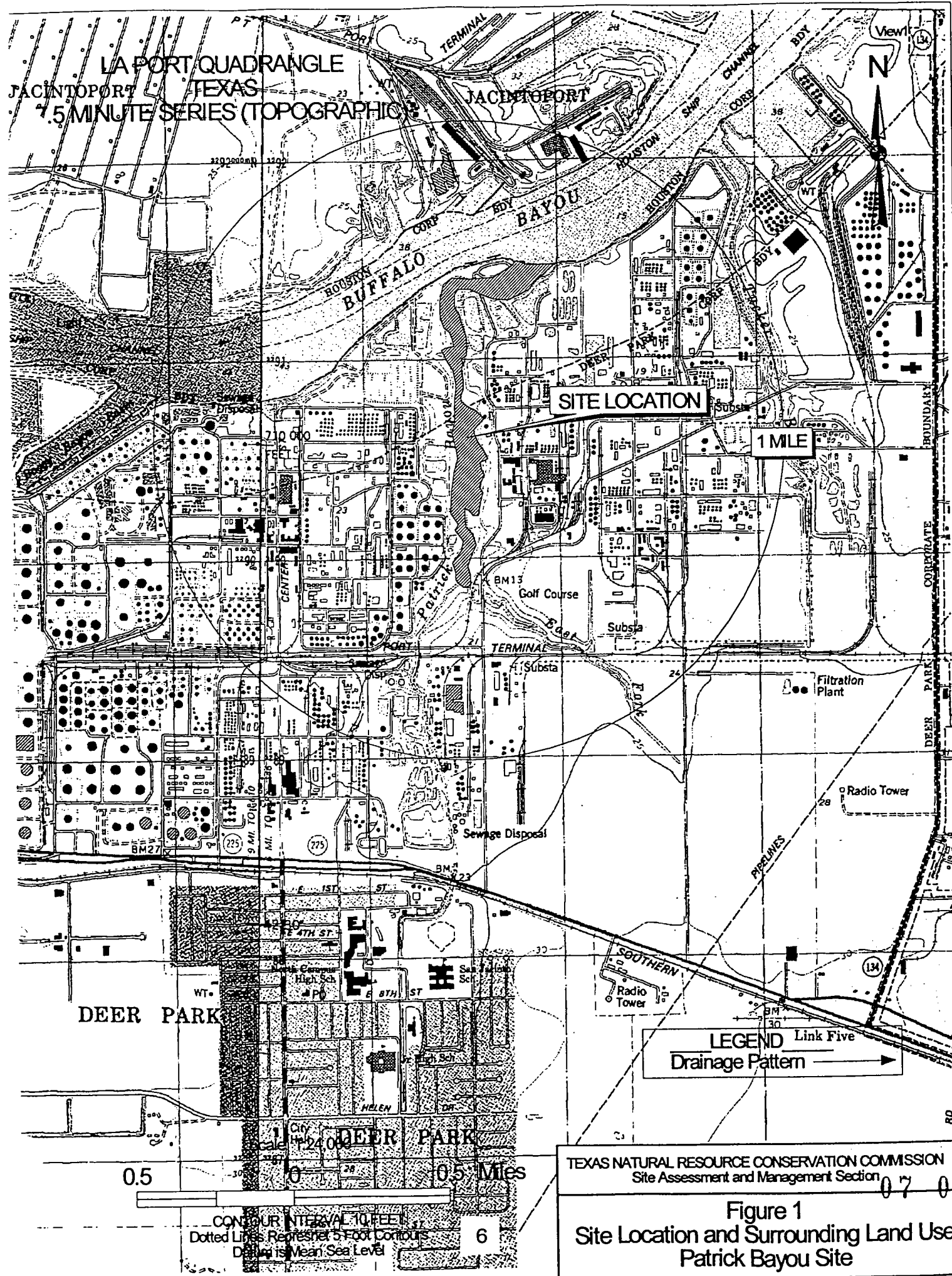
#### **SITE INFORMATION**

Patrick Bayou is one of several small bayou tributaries of the Houston Ship Channel located within the lower portion of the San Jacinto River Basin. The Houston Ship Channel (HSC) is the channelized portion of Buffalo Bayou that flows 10 miles east to Galveston Bay and the Gulf of Mexico permitting shipping traffic to enter the Port of Houston (ref 8, pg 507). As a result, Patrick Bayou is influenced by tidal action from Galveston Bay and the HSC. Patrick Bayou begins within the city limits of Deer Park, Texas, however most of the upper portion consists of a series of concrete/gunite-lined storm water discharge channels/culverts installed by the city for runoff control and several adjacent petrochemical facilities for a distance of approximately 0.4 miles south of State Highway (SH) 225. Patrick Bayou drains north to the HSC a total distance of 2.85 miles with the lower portion of the bayou containing earthen banks and a soft mud bottom (ref 5, pg 3). The bayou is approximately 600 feet wide within the last 0.25 mile before entering the HSC and is nearly 500 feet wide at its widest point adjacent to the OxyVinyls, LP chemical plant. The bayou contains wetland vegetation and is a natural habitat for waterfowl (ref 5, pg 5). The "site" is defined as the bounds of Patrick Bayou originating below the concrete/gunite box cover 0.4 miles below SH 225 extending north to its entry point at the HSC. The center of the site is located at Latitude 29°43'55" North, Longitude 95° 06' 52.5" West as shown in Figure 1. The site elevation is 0, mean sea level (ref 5, pg 31 and ref 6, pg 1).

The site is located in a mixed urban/highly developed industrial/petrochemical area in southeast Harris County north of Deer Park, Texas (population 27,652 - 1990 Census). The site is bordered to the north by navigable water, the Houston Ship Channel, to the east and west by major petrochemical companies and by the City of Deer Park to the south. Surrounding land use, the surface water drainage pathway to the confluence with the HSC and prominent land features are shown in Figure 1.

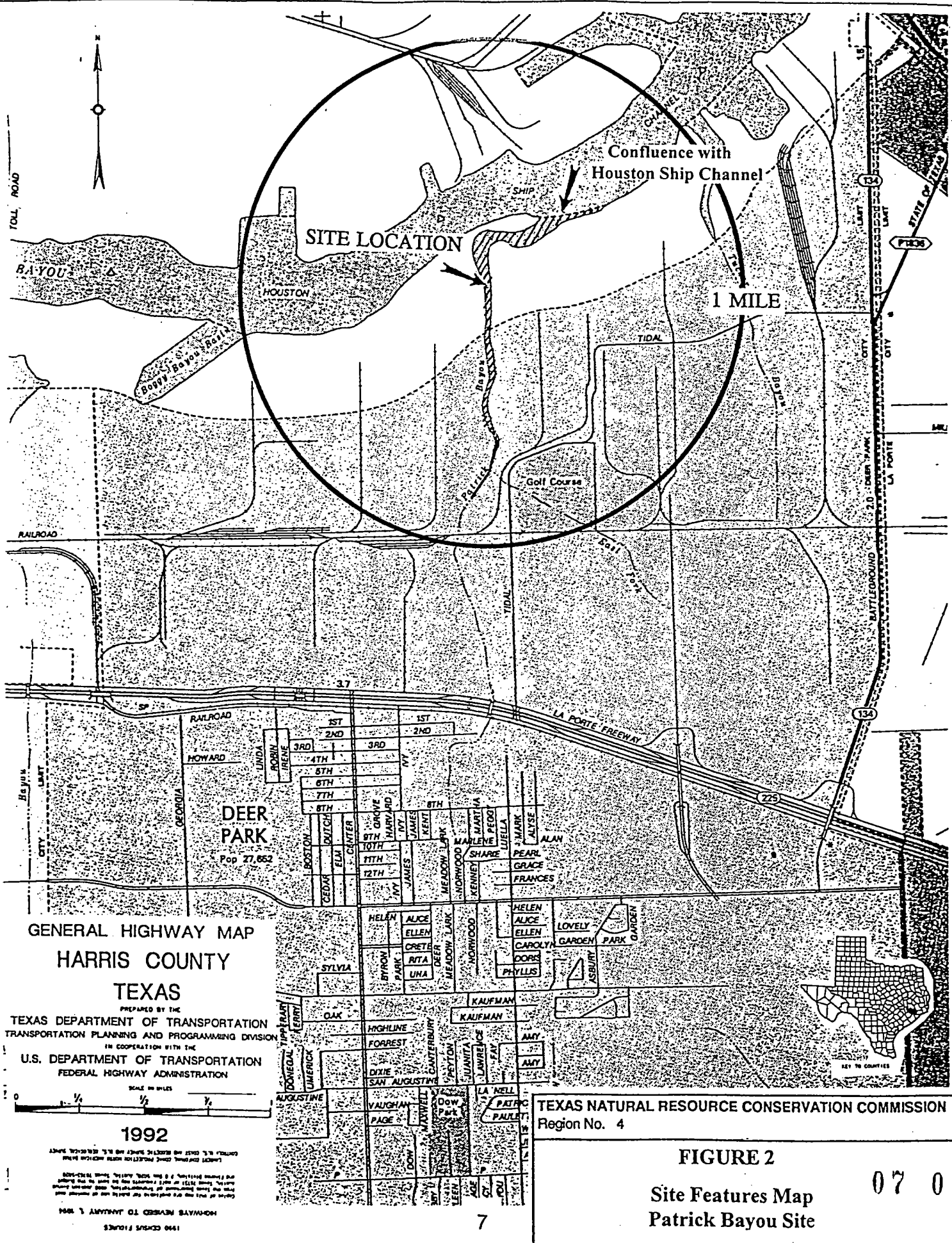
As depicted in Figure 2, the area of concern includes the in-water portion of Patrick Bayou that has received for a number of years an accumulation of permitted industrial wastewater discharges, municipal wastewater treatment plant effluent and storm water discharges from adjacent industrial sites and nearby urban/residential areas. Hazardous substances may have originated from these discharges or from spilled material transported along the surface water pathway that will be the focus of this investigation (ref 5, pages 3-5).

Access to the site is limited and restricted since the shoreline surrounding the bayou is privately owned by three petrochemical companies. Each facility limits personnel access and requires entry through a visitor's gate and registration. The only access to the bayou from the north is by a shallow draft boat entering from the HSC (ref 5, pg 3).



TEXAS NATURAL RESOURCE CONSERVATION COMMISSION  
Site Assessment and Management Section

Figure 1  
Site Location and Surrounding Land Use  
Patrick Bayou Site



The joint-TNRCC/IJSEPA Containment Assessment of Patrick Bayou, dated December 1996 (see Appendix A), identifies the surface water pathway as the primary pathway of concern. Discussion of this pathway is summarized in the following sections.

## **WASTE CONTAINMENT/HAZARDOUS SUBSTANCE IDENTIFICATION**

### **Characteristics**

The information used to identify the waste characteristics at the Patrick Bayou Site was obtained from a review of TNRCC central office and regional records. The site was identified to have multiple waste source discharges entering along the surface water pathway where a multitude of hazardous substances may have been released and as a result, the site may contain sediments that have become contaminated from hazardous substance migration. A record review identified DDD, DDT, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, 2-methylnaphthalene, phenanthrene, benzo(a)anthracene, benzo(a)pyrene, benzp(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(123cd)pyrene, pyrene, hexachlorobenzene (HBC), hexachlorobutadiene (HCBd), hexachloroethane (HCE), bis(2ethylhexyl)phthalate, carbazole, dibenzpofuran, 1,3-dichlorobenzene, 1,4-dichlorobenzene, di-n-butylphthalate, 1,2,4trichlorobenzene, arsenic, chromium, copper, lead, manganese, mercury, nickel, selenium, zinc, PCB Aroclor 1248 and dioxin as the potentially hazardous substances within the site. These wastes may have originated from numerous discharge sources entering Patrick Bayou.

During the July 26, 1994, jointly-sponsored TNRCC Region 12/USEPA Containment Assessment of Patrick Bayou, multiple waste sources were identified discharging to Patrick Bayou either under industrial wastewater or municipal wastewater treatment discharge permits or from storm water runoff collection system discharge outfalls. A record review identified the following areas of interest where hazardous substances may have originated. Approximate locations of these sources are shown in Appendix A, Figure 2 and a list indicating the assigned TNRCC permit number, outfall identification number, permitted wastewater discharge in million gallons per day (mgd) and owner are provided in Table 1, Appendix , A. Specific areas that will be investigated during the SSI include (ref 5, pgs 3-4, 42 and 30):

(1) the OxyVinyls, LP Outfalls No. 003, 002 and 001 (Permit No. 00305) located approximately 0.4 mi., 0.6 mi. and 0.85 mi. respectively south of the bayou's convergence with the Houston Ship Channel. OxyVinyls, LP is a chemical manufacturing facility with three cooling water outfalls. Outfall 001 carries treated wastewater from their mercury cell process area. Outfall 002 is the largest with a daily discharge of 105 mgd and outfall 003 carries cooling water, utility wastewater and accumulated storm water. In 1993, OxyVinyls, LP installed a retaining wall 60' deep along the east side of Patrick Bayou beginning just south of outfall 003 extending north to a bridge near the mouth of the bayou;

(2) the Shell Refinery and Shell Chemical Company Outfalls No. ROO I and COO I (Permits No. 00403 and 00402) located approximately 1.5 mi. south of the convergence with the HSC. The Shell Chemical Company outfall COO I contains both industrial and domestic wastewater discharges plus there are two additional outfalls installed nearby for storm water discharge. All three of these outfalls discharge to the gunite-lined portion of upper Patrick Bayou in an

area located south the Shell Company Road bridge as shown in Figure 2, Appendix A. The Shell Refinery (separate company) outfall R001 carries boiler blowdown wastewater and accumulated storm water discharging to the same gunite-lined portion of upper Patrick Bayou approximately 250' north of the Shell Chemical Company outfall COOL. In addition, Shell Refinery has four other storm water collection outfalls discharging to Patrick Bayou. It was noted the main process outfall for Shell Refinery (outfall 007) discharges to the HSC and is located up-channel from the HSC convergence with Patrick Bayou;

(3) the Lubrizol Corporation Outfall, No. 001 (Permit No. 00639) located approximately 1.8 mi. south of the convergence with the HSC. The outfall carries treated process water, contaminated ground water and storm water from their lubricant-manufacturing facility. The outfall enters the upper gunite-lined portion of Patrick Bayou inside a box culvert and is not readily accessible. Lubrizol has a total of six other storm water collection system discharge outfalls that drain to Patrick Bayou;

(4) the City of Deer Park WWTP discharge point (Permit No. 10519) located approximately 2.3 mi. south of the convergence with the HSC. The Deer Park discharge consists of treated municipal wastewater which flows east along a ditch located north of and along SH 225 (the LaPorte Freeway) entering the gunite-lined portion of upper Patrick Bayou just south of the highway; and finally,

(5) the Praxair discharge point (Permit No. 01173) located approximately 1,500' east of outfalls R001 and C001 for the Shell's Deer Park Manufacturing Complex. The outfall discharges from the plant east to a drainage channel flowing north along a railroad track towards the East Fork tributary of Patrick Bayou. The discharge contains cooling tower wastewater, boiler blowdown, domestic wastewater and process wastewater from their air separation plant. The discharge enters Patrick Bayou at approximately 1.13 mi. south of the HSC convergence.

A summary of waste characteristics, sample location Identification No. and detected contaminants are provided in Appendix A, Table 6 - Water Sample Results, Table 7 - Sediment Sample Results for Metals, Table 8 - Sediment Sample Results for Organics and Table 9 - Sediment Sample Results for Other Organic Compounds (ref 5, pgs 36-38).

### **Required Information (Data-Gaps)**

- Field verify site features and locations as depicted in Figure 2.
- Field verify the location of the discharge areas identified as possible sources of the contaminants entering the bayou. Note any evidence of a chemical release, i.e., stains or stressed vegetation and obtain soil/sediment samples to confirm the release of contaminants.
- Field verify previous/current waste management activities conducted adjacent to the site and obtain information on hazardous substances related to these activities through observation and interviews with nearby industrial representatives, municipal wastewater treatment operators and/or nearby residents.

- Obtain, as a minimum, three background sediment samples to determine the naturally occurring levels for the contaminants of concern from unaffected areas located adjacent to the site.

## **GROUND WATER PATHWAY AND TARGETS**

### **GROUNDWATER TO SURFACE WATER PATHWAY AND TARGETS**

The Groundwater and Groundwater to Surface Water Pathways for the Patrick Bayou Site will not be evaluated since the "site" is defined as the accumulated contaminated sediments within Patrick Bayou that may have originated from multiple discharge sources. The Surface Water Pathway will be explored initially to evaluate those sources and assess potential contaminant migration.

### **SURFACE WATER PATHWAY AND TARGETS**

#### **Characteristics**

Patrick Bayou is a small tidal tributary of the Houston Ship Channel (HSC) located along the lower portion of the San Jacinto River Basin (Segment 1006) that flows through a heavy petrochemical industrial area located on the south side of the HSC. Patrick Bayou originates approximately 3.0 miles upstream within the city limits of Deer Park, Texas. A small tributary, East Fork, drains to Patrick Bayou entering 1.3 miles from the convergence with the HSC as shown in Figures I and 2. The designated uses for Segment 1006 are industrial water supply and navigation. A restricted consumption advisory for the general population and a no-consumption advisory for children and women of childbearing age have been issued for a six-mile section of the stream segment by the Texas Department of Health due to elevated levels of dioxin in blue crabs and catfish. A paper mill is listed as the source of dioxin (ref 5, pg 3 and-ref 8, pg 659 and 698).

The majority of the upper portion of Patrick Bayou beginning at a storm water discharge channel box located 1.7 miles from the confluence at the HSC is entirely enclosed or lined with gunite/concrete installed by the City of Deer Park and adjacent industries for storm water runoff control. The lower portion of the bayou has earthen banks and a soft mud bottom. The delta portion of the lower bayou is approximately 600 feet wide within the last 0.25 mile before entering the HSC and is nearly 500 feet wide at its widest point adjacent to the OxyVinyls, LP chemical plant. The bayou contains wetland vegetation and is a natural habitat for waterfowl. The East Fork tributary is more stream-like in contour and has more riparian vegetation than the main bayou (ref 5, pgs 3 and 5).

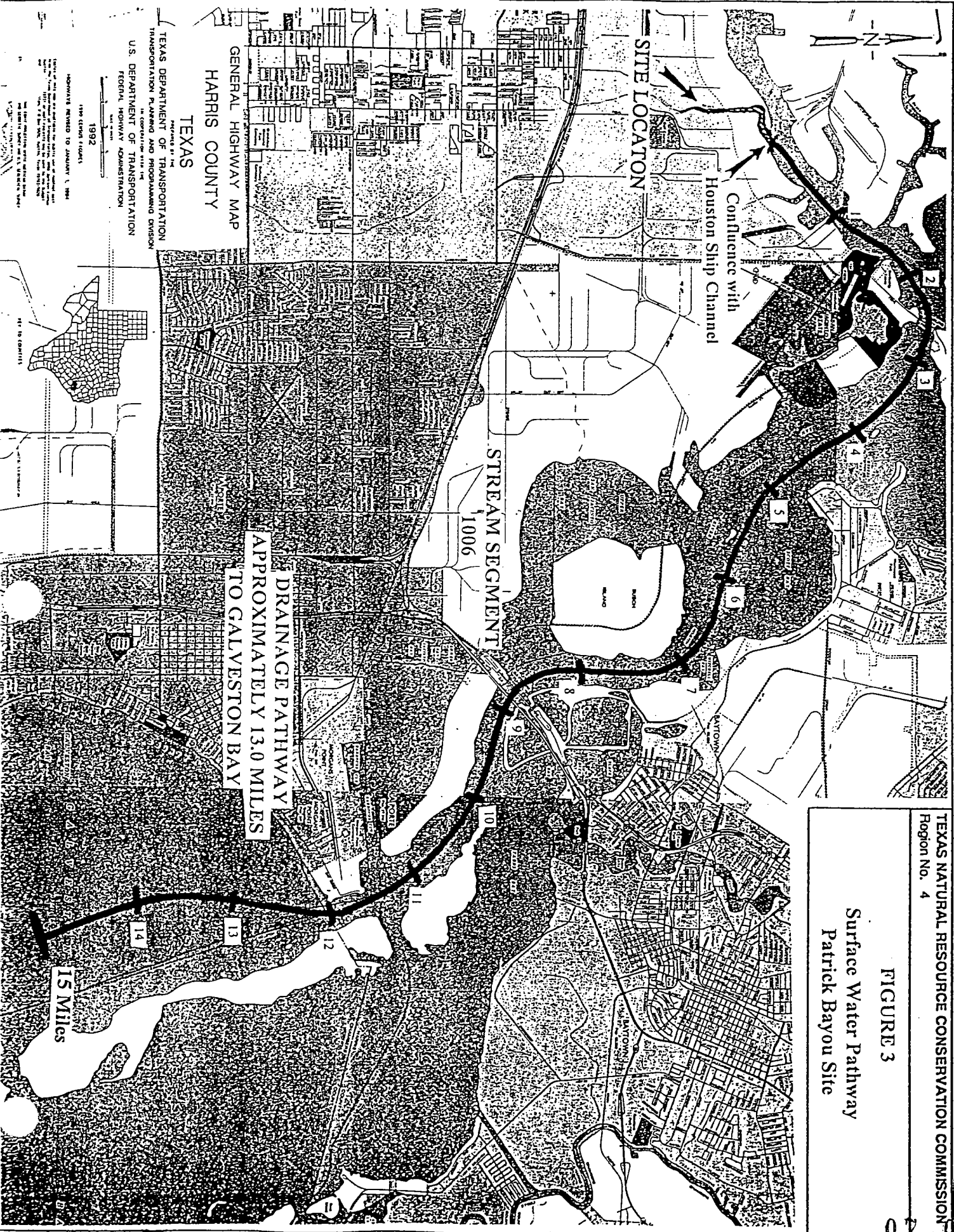
The 2-year 24-hour rainfall for the area of the site is approximately 5.0 inches (ref 9, page 95).

#### **Targets**

Since the site is defined as the contaminated sediments accumulating within Patrick Bayou which is a body of water, it has not been necessary to designate a Point of Probable Entry (PPE). The 15-mile surface water drainage pathway from Patrick Bayou to Galveston Bay shown in Figure 3 is provided as a reference. It has not been determined whether there are any surface water users along the 15-mile target distance limit for Patrick Bayou.



FIGURE 3  
Surface Water Pathway  
Patrick Bayou Site



It has not been determined if there are any wetland areas, sensitive environments or endangered species within a 4-mile radius of the site.

A file review revealed that part of the joint-TNRCC/LJSEPA Containment Assessment of Patrick Bayou included ambient water and sediment toxicity evaluations to typical aquatic habitants and sediment samples were collected from the bayou for quantitative macrobenthic organism counts. Results indicated significant adverse effects from all five of the ambient water toxicity evaluations and because of the number of contaminants detected, it was difficult to determine the single compound or combination of compounds responsible for the observed toxicity. Results of the macrobenthic community assessment indicated degraded conditions based on similar oligohaline areas of Galveton Bay and from two benthic samples collected elsewhere in the HSC system (San Jacinto Bay) (ref 5, pgs 18-19).

### **Required Information (Data Gaps)**

- Field verification to determine the location of drainage channels, outfalls and overland flow drainage patterns to Patrick Bayou and its tributary.
- Collect sample data to substantiate whether contaminants may have migrated along these surface water pathway to the bayou.
- Field verification to determine if there are any sensitive environments, endangered species or wetlands located within the bayou. Determine if the bayou is used as a fishery.
- Field verification to determine if there are any surface water users within the 15-mile target distance limit and determine the use of the surface water.
- Obtain, as a minimum, three background sediment samples to determine the naturally occurring levels for the contaminants of concern from unaffected surface water pathway areas located adjacent to the site.

### **SOIL EXPOSURE PATHWAY AND TARGETS**

The Soil Exposure Pathway will not be evaluated since there are no on-site residents, workers or schools/day care centers being exposed to remaining site contamination and controlled access by the adjacent property owners precludes inadvertent entry/exposure. Sediment samples collected to verify accumulated source contaminants for the surface water drainage pathway will be used to assess the soil exposure pathway.

### **Required Information (Data Gaps)**

- Determine adequacy of site security, i.e., gates, fences, locks and warning signs, to preclude inadvertent entry to the bayou sediments.
- Substantiate that there are no on-site residents, workers, schools, day care centers or other resources that may be exposed to source contaminants.

## **AIR PATHWAY AND TARGETS**

The Air Pathway will not be evaluated due to the lack of an observed and documented air release.

### **Required Information (Data Gaps)**

- Field verification of the distance to the nearest resident subject to exposure from a release of hazardous substances through the air.
- Field verification of potential targets in the target distance radii.

## **SECTION 3**

### **SITE NONSAMPLING DATA COLLECTION AND FIELD WORK**

The Texas Natural Resource Conservation Commission (TNRCC) will perform the activities described in this section to provide site background information and analytical data that can be used by the EPA to evaluate the Patrick Bayou site using the Hazard Ranking System (HRS). This information will be presented in a documentation report that includes source and sediment sampling as discussed below.

All field work will be conducted in accordance with the Patrick Bayou Site health and safety plan (HSP) and the TNRCC-approved quality assurance project plan (QAPP). The HSP and QAPP are in appendices C and D, respectively. These plans will be reviewed by all personnel upon arrival at the site.

### **PERSONNEL REQUIREMENTS AND RESPONSIBILITIES**

The TNRCC Central Office Technical Director for this preliminary assessment/screening site inspection (PA/SSI) is Mr. Wesley Newberry and the TNRCC Program Manager is Mr. Allan Seils. The TNRCC Site Investigation Manager is Mr. J. D. Thompson, Region 4 Office, Arlington, Texas. Other team members will be identified prior to the sampling event. The TNRCC's Central Office mailing address is the Remediation Division, Site Assessment and Management Section (SAM)/MC 142, P.O. Box 13087, Austin, Texas 78711-3087, (telephone no. (512) 239-2514, FAX No. (512) 23 9-4814). The TNRCC Region 4 Office mailing address is 110 1 East Arkansas Lane, Arlington, Texas 76106, (Telephone No. (817) 469-6750, JAX No. (817) 795-2519).

The TNRCC Central Office Program Manager and Site Investigation Manager are responsible for identifying, assigning and organizing the staff to execute the activities required to complete the PA/SSI. The Site Investigation Manager is responsible for completing the activities described in this plan and adhering to the sampling activities and report schedule. The planned field schedule for activities at the Patrick Bayou Site is listed in Table 1.

The TNRCC Technical Director and Program Manager will review all major reports and provide technical and administrative support to the Site Investigation Manager. The TNRCC Technical Director will review the work plan and final report and will approve the final versions. In addition, the TNRCC Technical Director and Program Manager will provide oversight for the field activities during the investigation. The EPA Region VI site assessment manager (SAM) is responsible for approving the sampling activity's work plan and reviewing the final report.

**Table 1. Patrick Bayou Site Field Schedule**

Time	Activity
<b>Day I - Travel Day/On- and Off-Site Reconnaissance</b>	
1400	Arrive at the site. Meet adjacent property owners for property access, obtain company safety briefs and verify site specific data. Establish staging area and identify bayou access points.
1530	Conduct site reconnaissance to verify planned sample locations. Locate appropriate on-and off-site sample locations. Modify sampling plan (if required).
1700	Return to motel. Prepare shipping and sampling labels. Prepare the field logbook.
1800	End of day.
<b>Day 2 - Collect Deep Water Sediment and Background Samples</b>	
0800	Meet at the Channelview boat launch area. Review the health and safety plan and conduct daily safety meeting. Review sampling strategy and prepare/load sampling equipment.
0830	Crew #1 - Obtain deep water boat and launch to site from Channelview. <u>Crew #2</u> - Depart for site by van and begin collecting background sediment samples in East Fork tributary.
0900	<u>Crews #1</u> - Begin collecting up- and downstream sediment samples beginning with the most downstream sample first. <u>Crew #2</u> - "Begin collecting upstream background sediment samples in the East Fork tributary. Record applicable sampling data.
1200	Lunch break.
1300	Continue collecting up-and downstream sediment samples. Record applicable sampling data. Document sample locations with photographs and GPS data.
1530	Complete collecting sediment samples'. Meet at pre-designated location, decon all nondedicated sampling equipment and collect a final rinsate sample (if required).
1600	Complete sample packaging and prepare CLP lab documentation.
1800	Deliver samples for overnight shipping. End of day.
<b>Day 3 - Collect Remaining Sediment and On-Site Source Samples</b>	
0700	Meet at on-site staging area. Review health and safety plan and conduct daily safety meeting. Review/modify sampling strategy and prepare sampling equipment.
0800	Begin collecting off-site source/outfall area sediment samples. Record applicable sampling data in logbook documenting sampling locations with photographs/applicable GPS data.
1200	Lunch break.
1300	Continue on-site source/outfall area sampling. Load sampling equipment in shallow draft skiff for collecting in-bayou samples. Record applicable sampling data in the logbook documenting sampling locations with photographs and applicable GPS data.
1530	Complete collecting on-site source/outfall area samples.
1600	Complete sample packaging and prepare CLP lab documentation.
1800	Deliver samples for overnight shipping. End of day.
<b>Day 4 - Return Travel Day</b>	

## **COMMUNITY RELATIONS**

Prior to the start of any work at the Patrick Bayou Site, TNRCC will inform the appropriate Harris County and City of Houston authorities of the sampling event as applicable. Property owners in the immediate area where samples will be collected will be contacted by letter from the TNRCC or during the initial off-site reconnaissance visit. Requests for information will be made during the interview process or identified in the letter from the TNRCC. The TNRCC will make no other formal notifications of the PA/SSI sampling events. Sample results will be sent to each property owner, for their property only, upon completion of the data quality assurance process. Any requests for information before or after the planned screening site inspection which the TNRCC receives from the above will be referred through the PA/SI Program Manager for an appropriate response. Any requests for information by the news media or parties not associated with Patrick Bayou Site will be directed through the TNRCC Technical Director or his designee to the TNRCC Central Office Media Relations Office, P.O. Box 13087, Austin, TX 78711, telephone (512) 239-5000.

The TNRCC Program Manager will provide each member of the TNRCC inspection team and the Site Investigation Manager with letters of introduction stating the purpose of the investigation and authorization to conduct appropriate field activities. The TNRCC will send notification letters to the appropriate property owners informing them of the impending sampling activities and requesting access authorization for TNRCC inspectors. The TNRCC will make arrangements for the property visit only after receiving written or verbal access authorization from the property owner or their representatives.

## **WORK, PLAN ACTIVITIES**

### **Task 1: Nonsampling and Sampling Activities and Rationale**

The field team will first meet (if specifically requested) with property owner representatives at a suitable location for required plant safety briefings or at the site staging area. The purpose of the meeting will be to conduct an initial safety briefing and review the intended sampling work schedule. Information concerning past and current site conditions outlined in the PA/SSI work plan will be discussed and verified. The Site Investigation Manager will record significant comments in the field logbook pertaining to site and property history and current/past operations.

After the initial meeting, an off-site reconnaissance inspection will be completed by designated team members. Information will be logged in the field logbook to include names of individuals interviewed, physical/mailling addresses, date and time of interviews and observations noted. Information outlined in the Site Reconnaissance Checklist (Appendix E) applicable to off-site requirements will be obtained during the inspection. The off-site reconnaissance will be conducted at level D (Modified) protection.

During the initial reconnaissance inspection of the Patrick Bayou Site, the sampling team may be accompanied by the current property owner or their designated representative to assist in identifying potential hazards. Appropriate safety equipment will be required by each team member, which may include steel toed chest-high waders. Personnel protective equipment will initially be modified level D.

Each waste management area will initially be approached to detect and identify any physical hazards that may be present and to identify evidence of contaminant migration. Any visual evidence of a release of hazardous substances will be noted to ascertain whether additional protective equipment will be required for the sampling events. In general, personnel safety requirements will be identified and assessed during the initial site reconnaissance inspection. In addition, safe entry and exit points will be identified for each proposed sampling event.

Upon completion of the site reconnaissance activities, the field team will again review the sampling plan. Sample locations will be adjusted as necessary to ensure that the samples provide sufficient data to properly evaluate the site. Photographs will be taken as required to document site and property conditions and support observations recorded in the field logbook. Photographs will require at a minimum, the following information for each photograph:

- Site name
- Location
- Name of photographer
- Date and time of photograph
- Description of situation/scene photographed..
- Type of camera, film, and lens setting (Must be 50mm).

The following section describes the proposed sampling plan for the Patrick Bayou Site. This plan may be modified as a result of the on-site reconnaissance and/or noted property access constraints. The samples to be collected and sample rationale are listed in Table 2. Proposed sample analyses, containers, and preservation requirements for the sediment and decontamination rinsate samples are shown in Table 3 and 4, respectively. Sample locations will be confirmed during the site reconnaissance inspection and noted in the field logbook. A field copy of this work plan will be annotated by the Site Investigation Manager to reflect actual sample locations.

**Table 2. Proposed Samples to be Collected**

Sample Matrix	Sample ID	Sample Location	Rationale
Sediment Samples	SE-01	Unaffected upstream sediment sample collected from Houston Ship Channel at depth 0"to 24".	Obtain upstream <b>background</b> sediment sample for attribution of contaminants.
	SE-02	Unaffected upstream sediment sample collected from Houston Ship Channel at depth 0"to 24".	Obtain upstream <b>background</b> sediment sample for attribution of contaminants.
	SE-03	Unaffected upstream sediment sample collected from Houston Ship Channel at depth 0"to 24".	Obtain upstream <b>background</b> sediment sample for attribution of contaminants.
	SE-04	Sediment sample collected from the <b>confluence</b> at the Houston Ship Channel.	Assess site contamination migrating along the surface water pathway.
	SE-05	Second sediment sample collected from the <b>confluence</b> at the Houston Ship Channel.	Assess site contamination migrating along the surface water pathway.
	SE-06	Quality Assurance/Quality Control (QA/QC).	<b>Duplicate</b> sediment sample collected at the same location as SE-05.
	SE-07	Sediment sample collected <b>beyond the confluence</b> and before the industrial outfall at Sta 02.	Assess site contamination migrating along the surface water pathway.
	SE-08	Second sediment sample collected <b>beyond the confluence</b> and before the industrial outfall at Sta 02.	Assess site contamination migrating along the surface water pathway.
	SE-09	Quality Assurance/Quality Control (QA/QC).	<b>Duplicate</b> sediment sample collected at the same location as SE-08.
	SE-10	Unaffected upstream sediment sample collected from the East Fork tributary at depth 0"to 24".	Obtain upstream <b>background</b> levels for attribution of site contaminants.
	SE-11	Unaffected upstream sediment sample collected from the East Fork tributary at depth 0"to 24".	Obtain upstream <b>background</b> levels for attribution of site contaminants.
	SE-12	Unaffected upstream sediment sample collected from the East Fork tributary at depth 0"to 24".	Obtain upstream <b>background</b> levels for attribution of site contaminants.
	SE-13	Sediment sample collected downstream from the Praxair permitted outfall 001 (Replicating Sta 10).	Assess site contamination migrating along the surface water pathway.
	SE-14	Sediment sample collected downstream from the OxyVinyl Golf Course at the Patrick Bayou entry.	Assess site contamination migrating along the surface water pathway.
	SE-15	Sediment sample collected upstream from the Deer Park WWTP permitted outfall. (Replicating Sta 09).	Determine <b>background</b> levels upstream from the Deer Park WWTP outfall.
	SE-16	Quality Assurance/Quality Control (QA/QC).	<b>Duplicate</b> sediment sample collected at the same location as SE-14.
	SE-17	Sediment sample collected downstream from the combined Lubrizol Corp. outfall 001 and WWTP outfall 001 discharge point. (Replicating Sta 07).	Assess site contamination migrating along the surface water pathway.



Sample Matrix	Sample ID	Sample Location	Rationale
	SE-18	Sediment sample collected downstream from the Shell Oil Company/Shell Refinery outfalls C001 and R001. (Replicating Sta 06)	Assess site contamination migrating along the surface water pathway.
	SE-19	Sediment sample collected from the in-water segment of Patrick Bayou downstream of East Fork.	Assess site contamination migrating along the surface water pathway.
	SE-20	Sediment sample collected downstream from the OxyVinyl permitted outfall 001. (Replicating Sta 04).	Assess site contamination migrating along the surface water pathway.
	SE-21	Quality Assurance/Quality Control (QA/QC).	<b>Duplicate</b> sediment sample collected at the same location as SE-19.
	SE-22	Sediment sample collected downstream from the OxyVinyl permitted outfall 002.	Assess site contamination migrating along the surface water pathway.
	SE-23	Sediment sample collected downstream from the OxyVinyl permitted outfall 003 in a wetland area.	Assess site contamination that may be impacting a wetland habitat
	SE-24	Sediment sample collected downstream from the OxyVinyl permitted outfall 003. (Replicating an area further downstream from Sta-03).	Assess site contamination migrating along the surface water pathway.
	SE-25	Sediment sample collected from a wetland area within the bayou as it turns east towards the HSC.	Assess site contamination that may be impacting a wetland habitat
	SE-26	Sediment sample collected in the widest portion of lower Patrick Bayou. (Replicating Sta 2.5).	Assess site contamination migrating along the surface water pathway.
	SE-27	Sediment sample collected from the south shoreline of Patrick Bayou in a wetland area.	Assess site contamination that may be impacting a wetland habitat
	GW-01	Quality Assurance/Quality Control (QA/QC).	Final <b>equipment</b> rinsate sample obtained <u>before</u> conducting sediment sampling (as required).
	GW-02	Quality Assurance/Quality Control (QA/QC).	Final <b>equipment</b> rinsate sample <u>after</u> final sampling if used more than once (as required).
	GW-03	Quality Assurance/Quality Control (QA/QC).	<b>Field Blank</b> for VOA analysis of <u>before</u> equipment rinsate sample.
Rinsate Samples	GW-04	Quality Assurance/Quality Control (QA/QC).	<b>Field Blank</b> for VOA analysis of <u>after</u> equipment rinsate sample.

**Table 3. Sample Containers, Methods, Preservatives, and Holding Times for Soil/Sediment**

Parameters	Sample Container	Preservative	Holding Time
Volatile Organic	Two 4-ounce wide mouth glass jars with Teflon-lined septa	Cool to 4 <sup>0</sup> C	14 days
Sernivolatile Organic	Two 4-ounce wide mouth glass jars with Teflon-lined lids	Cool to 4 <sup>0</sup> C	Extract within 14 days of collection and analyze within 40 days of extraction.
Pesticides/PCBs	Two 4-ounce wide mouth glass jars with Teflon-lined lids	Cool to 4 <sup>0</sup> C	Extract within 14 days of collection and analyze within 40 days of extraction.
Metals/Cyanide	Two 4-ounce wide mouth glass jars with Teflon-lined lids	Cool to 4 <sup>0</sup> C	180 days after collection for metals and 14 days for cyanide

**Table 4. Sample Containers, Methods, Preservatives, and Holding Times for Aqueous Samples**

Parameters	Sample Container, '	Preservative	Holding Time
Volatile organics	Two 40-ml wide mouth glass vials with Teflon-lined septa	Cool to 4 <sup>0</sup> C	7 days
Sernivolatile organ ics	Two I -lifer amber glass bottles with Teflon-lined lids	Cool to 4 <sup>0</sup> C	Extract within 7 days of collection and analyze within 40 days of extraction.
Pesticides/PCBs	Two I -liter amber glass bottles with Teflon-lined lids	Cool to 4 <sup>0</sup> C	Extract within 7 days of collection and analyze within 40 days of extraction.
Metals/Cyanide	Two I -liter polyethylene bottles with Teflon-lined caps	HNO <sub>3</sub> to pH<2 /NaOH to pH> 12 Cool to 4 <sup>0</sup> C	6 months (except mercury) and 14 days for cyanide

\* Reference: EPA Contract Laboratory Program Statement of Work for Organics Analysis (March 1990) and Statement of Work for Inorganic Analysis (March 1990).

## **Waste Containment/Hazardous Substance Identification**

Based on existing site characterization data, the primary contaminants of concern already documented within Patrick Bayou may have originated from a multitude of waste producing sources that are currently permitted to discharge to the bayou. These potential sources include seven industrial process and wastewater discharge outfalls and a municipal wastewater treatment plant outfall. In addition, there are numerous storm water collection system discharge outfalls located along the surface water drainage pathway that may be potential sources for the detected contaminants. To obtain legally defensible site characterization data, a laboratory will be designated to perform EPA-stipulated Contract Laboratory Program (CLP) analytical methods on all samples collected from the Patrick Bayou Site to adequately document current site conditions. The specific analytical methods for this sampling event are those listed under the CLP routine analytical services (RAS) contract.

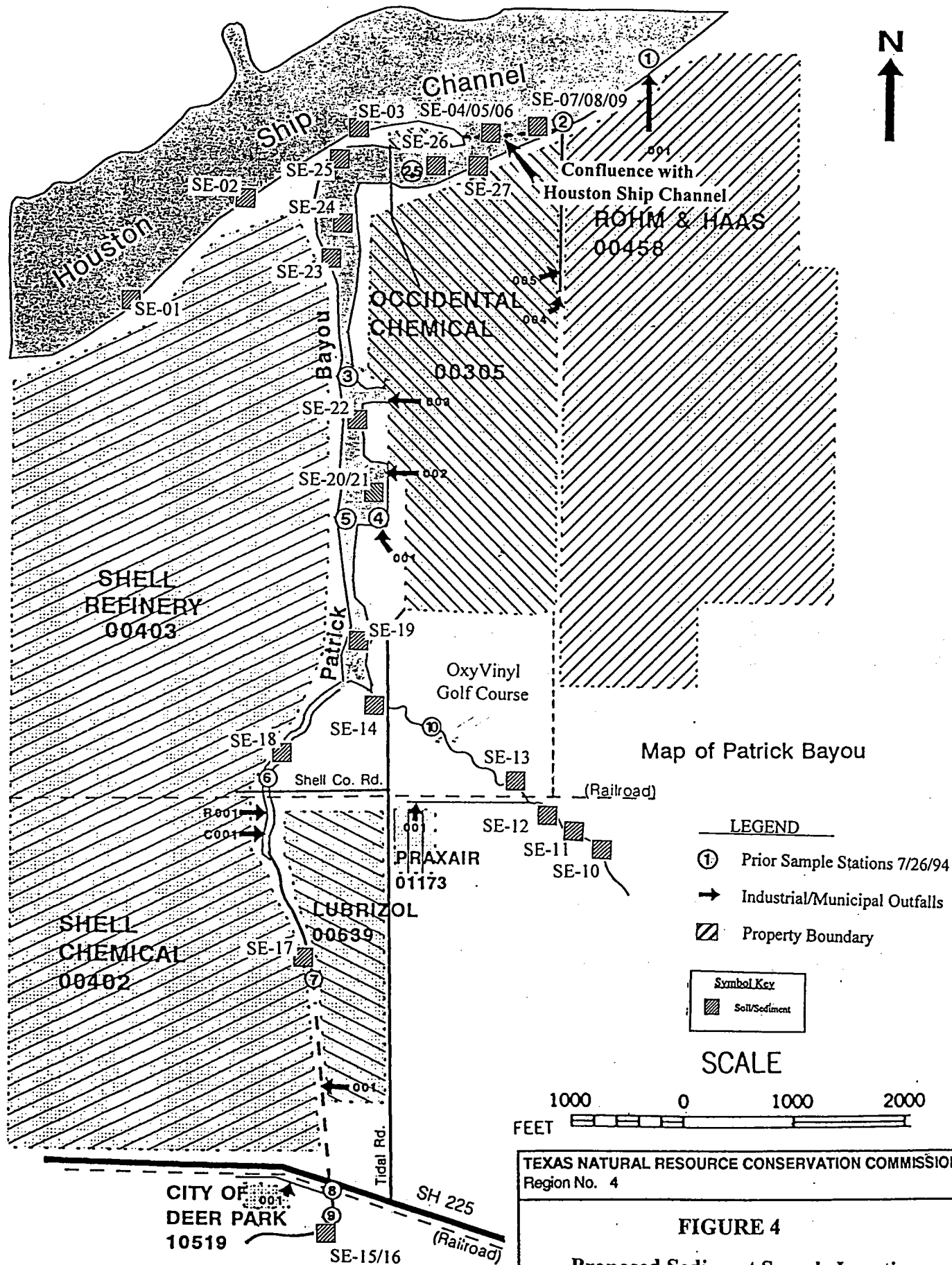
Nonsampling data to be collected include:

- Verify the Patrick Bayou Site's boundary features and approximate source areas through direct field observation and/or inter-views with adjacent property owners.
- Approximate the volume and type of waste--material being discharged to the bayou by inspection or through interviews with adjacent property owners.

Samples will be collected from on-site areas to characterize the site and to assess the potential migration of accumulating contamination along the surface water pathway. In addition, sediment samples will be collected to determine the natural occurring background levels of inorganics (metals), organics (volatiles, semi-volatiles, PCBs and pesticides) and cyanide in unaffected off-site locations for attribution of detected contaminants.

For the purpose of this PA/SSI, a total of ten (10) sediment (SE) samples to include a duplicate will be collected to substantiate the release of contaminants to the bayou and to further characterize source wastes. An additional five (5) off-site background sediment samples (SE- 10, - 11, - 12 and SE-15, -16) will be collected from unaffected upstream locations as determined by a field inspection. Actual background sample locations will be determined during the off-site reconnaissance where areas of natural undisturbed sediments can be visually assessed.

The sampling locations may be adjusted so that observed areas of contamination, as identified by potential soil/sediment contamination, visible soil/sediment staining or visible leachate collecting at the surface, are sampled. Sample identification, location and sample rationale are provided in Table 2 and approximate sample locations are illustrated in Figure 4.



## Surface Water Pathway

Nonsampling data to be collected include:

- Verify location of on-site drainage features, embankments and man-made flow containment features through visual observations made during the site reconnaissance survey.
- Verify potential wetland areas and determine whether the bayou may be considered a fishery through interviews with knowledgeable local residents, industrial representatives and obtain estimated annual human fish consumption data.
- Field verification of potential sensitive environments or endangered species within a 4-mile radius of the site.

For the purposes of the PA/SSI, a total nine (9) sediment (SE) samples including two duplicates will be collected to substantiate the release of on-site contaminants to the surface water pathway. Results will be used to document the potential for releases of contaminants to the adjacent Houston Ship Channel and the 15-mile stream segment as measured from its confluence with Patrick Bayou and to potential wetland areas identified within the bayou. Sediment samples will be collected along identified surface water drainage pathways and at the confluence with the HSC to establish that contaminants may have migrated from on-site sources.

Three (3) background sediment samples (SE-01 through SE-03) will be used for attribution of site contaminants that may be migrating along the surface water pathway. These background sediment samples will be collected at depths 0" to 24" along the Houston Ship Channel located upstream of its confluence with Patrick Bayou and upstream of the flow direction considering tidal influences. Sediment sample identification, location and sampling rationale are provided in Table 2. Approximate sample locations are shown in Figure 4.

These sediment samples will be collected in moderately quiescent areas where finer materials normally would settle. These areas include the outside bends of drainage channels, smaller side channels and areas where natural deposition would occur. Sediment samples for VOA analysis will be collected first, metals second and non-volatiles last. Rocks and twigs will be removed as much as possible before placing each sample in the jar.

As specified by the QAPP, sediment samples will be placed in glass jars and sealed with Teflon-lined lids. Each of the sediment samples will be placed in 4-ounce, wide mouth glass jars marked for the appropriate analysis. No head space will be left in the VOA sample jars. Sample jars will be marked for identification and placed on ice for preservation. Identification markings will include: facility location, sample number, type (composite or grab), date and time of collection, concentration (low, medium or high), analysis parameters requested and names of samplers.

To avoid cross contamination of samples, dedicated sampling equipment will be used, wherever possible. Equipment and personnel decontamination procedures are described in the QAPP (Appendix D). Proper sample containers, preservation and holding times for CLP soil/sediment samples are presented in Table 3.

## **Soil Exposure Pathway**

The Soil Exposure Pathway will not be evaluated for lack of on-site targets and present site security precludes inadvertent public entry for possible exposure, to remaining source contaminants. Samples collected to verify remaining source contamination and evaluate the surface water exposure pathway will be used to assess the potential for release to the soil exposure pathway,

Nonsampling data to be collected include:

- Determine adequacy of site security, i.e., gates, fencing and locks.
- Verify site drainage patterns and likely soil exposure pathways by direct observation during the site reconnaissance inspection.
- Determine, if sensitive environments or endangered species habitats exist within or along identified off-site migration pathways by visual inspection or interviews with knowledgeable local personnel.
- Verify the distance to the nearest residence, nearby schools, day care center, park or recreational area through observation.

## **Air Pathway**

The Air Pathway will not be evaluated due to the lack of an observed release; however, result of source characterization samples will be used to assess the potential for releases to the air pathway.

Nonsampling data to be collected include:

- Verify the location of the nearest resident and occupied building by observation during the off-site reconnaissance inspection.
- Confirm that there have been no reports of adverse health effects due to releases of hazardous substances to the air by interviews with nearby long-term residents and a review of Public Health Department records.
- Verify the existence of sensitive environments or endangered species within a 4-mile radius of the site through consultation with Texas Department of Parks and Wildlife (TDPW) staff or by observation during the off-site reconnaissance inspection.

## **Quality Assurance/Quality Control Samples**

Four types of QA/QC samples will be used in this sampling inspection. Duplicate samples will be taken at the rate of one (1) duplicate per matrix (sediments) and one (1) duplicate for every ten (10) samples collected or one (1) per day, whichever is greater. Field blanks will be collected and accompany each ice chest containing ground water samples shipped for volatile organic analysis. Equipment rinsate samples will be collected to establish that proper field decontamination procedures have been employed for sampling equipment which is used more than once in the field. In addition, temperature blanks will accompany each ice chest to the respective laboratories.

Volatile organics samples are susceptible to contamination by diffusion of organic contaminants through the Teflon-lined septum of the sample vial; therefore, a VOA field blank will be analyzed to monitor for possible sample contamination. The field blank also serves to detect contaminants in the sample bottles. Each field blank will be prepared by filling two VOA vials with CLP-specified grade water and shipping the blanks with the sample bottles. Field blanks accompany the sample bottles through collection and shipment to the laboratory and are stored with the samples. The field blanks will be analyzed for VOAs, total metals and cyanides. Results of field blank analyses will be maintained with the corresponding sample analytical data in the project file.

Organic contaminants and some inorganic contaminants may volatilize during collection and subsequent shipment to the laboratory due to warming temperatures in the shipping container; therefore, a temperature blank will be monitored to insure that samples are properly cooled during shipment. One temperature blank per ice cooler will accompany the sample containers to the laboratory. Each temperature blank will be prepared by filling one VOA vial with deionized water; enclosing it in a bubble bag; taping the package to the interior of the ice cooler and clearly marking it as the "temperature blank." Temperature blanks accompany the sample containers through collection and shipment to the laboratory and are stored with the samples. Results of shipment temperatures will be maintained with the corresponding sample analytical data in the project file.

An equipment rinsate sample(s) will be analyzed to detect possible sample contamination resulting from the use of non-dedicated sampling equipment and poor field decontamination procedures. Each equipment blank will be prepared by filling one 1-gallon amber glass bottle and two 1-liter polyethylene bottles with CLP-specified grade water collected from the final rinse of the decontaminated equipment and the sample is shipped with the other samples. The equipment rinsate sample(s) will be analyzed for volatiles, semi-volatiles, pesticides/PCBs, metals and cyanides. Results of equipment rinsate sample(s) analyses will be maintained with the corresponding sample analytical data in the project file.

## **Task 2: Decontamination Procedures**

### **Equipment Decontamination**

Proper decontamination procedures will aid in preserving the representativeness of the samples collected. Dedicated sampling equipment will normally be used to collect each sediment sample at the site. Dedicated plastic zero contamination tubes will be used to collect sediment samples not easily accessible. The dedicated sampling equipment will have been decontaminated prior to arrival at the site and sealed in plastic sealable bags in accordance with the QAPP. After sampling, gross contamination (visible) will be removed from the surface of the sampling equipment and it will be placed back in its original plastic bag. Further decontamination will be accomplished by a detergent scrub and distilled water rinse at a location away from the investigation location in accordance with the QAPP. To minimize cross contamination during processing and handling, the outside of each sample container will be wiped clean with clean paper towels prior to placing the container into a clean plastic bag and bubble-wrapping it for shipment. An effort will be made to keep the outside of sample containers free of gross contamination.

If sampling equipment (non-dedicated) must be used more than once in the field, then the decontamination procedures for sample equipment will be followed and an equipment rinsate sample

collected in the field at the end of each sampling day and/or between each sample matrix type sampled, whichever is greater.

Decontamination fluids used to clean equipment will be disposed of in the approximate area of the sampling location in accordance with investigation derived waste (IDW) guidelines.

### **Personal Decontamination**

All disposable clothing (i.e., Tyvek, gloves, etc.) will be rendered unusable prior to disposal to prevent inadvertent reuse. Boots will be scrubbed with detergent and rinsed with distilled water that will be disposed of on-site. Decontamination fluids from the non-dedicated equipment rinse (if used) will also be disposed of on-site. Locations for IDW disposal will be noted in the field log book.

### **Task 3: Sample Shipping**

During sampling activities, samples will be packed and preserved according to procedures described in the QAPP. Excess soil or liquid will be removed from the outside of each sample prior to placing it in a sealable plastic bag and placing it into an ice cooler packed with sealed ice bags. The Site Investigation Manager will assure that all appropriate paperwork necessary to ship samples to CLP laboratories for analysis is completed. Normally, a 21-day turnaround time for RAS will be requested. Details of the sample handling and chain-of-custody (COC) requirements are discussed in greater detail in the attached QAPP.

Samples collected each day will be shipped and delivered daily to the designated CLP laboratory for analysis using an overnight courier. The overnight freight courier pickup point and office schedule in the area of the facility is:

Airborne Express

5048 Timber Creek Drive

Houston, Texas 77536

Office hours - 8:00 a.m. to 7:00 p.m. M - F; 8:00 a.m. to 12:00 p.m. on Sat and closed Sun.

Call 1-(800)-247-2676 (1-800-AIR-BORN) to arrange for scheduled pickups.

The chain-of-custody forms will be checked, signed and placed in a sealable plastic bag and taped to the inside lid of the cooler. The outside of the cooler will be sealed with tamper-resistant tape which cannot be removed without tearing it. The sample custodian will sign across the seal prior to shipping the samples. In the event the shipper has to remove the cooler seal, the receiving laboratory will verify and record that the individual container, bottle or vial sample seals are still intact.

During sampling and sample shipment, the Site Investigation Manager (or his designee) will contact the CLP sample management office (SMO) representative, as designated on the CLP RAS Lab Assignment, each day that a shipment is sent. If there are any significant changes to the CLP analytical requirements, contact the TNRCC, Allan Seils, PAJSI Program Manager at (512) 239-2514, FAX (512) 239-4814 or his designee to coordinate and obtain approval for additional analytical requirements.



## REFERENCES

1. U.S. Environmental Protection Agency. Federal Register-40 CFR Part 300; Hazard Ranking System, Final Rule, Volume 55, No. 241, December 14,1990. 135 pages.
2. U.S. Environmental Protection Agency. Hazard Ranking System Guidance Manual, EPA 540-R-92-026, OSV\*rER Directive 9345.1-07, November 1992. 431 pages plus Appendix.
3. U.S. Environmental Protection Agency. Guidance for Performing Site Inspections Under CERCLA, Office of Emergency and Remedial Response, Hazardous Site Evaluation Division, Publication 9345.1-05, September 1992. 125 pages.
4. U.S. Environmental Protection Agency. 1996 Superfund Chemical Data Matrix (SCDM). June 1993.
5. Broach, Linda, Field Operations Division, Region 12 - Houston, Texas Natural Resource Conservation Commission and Crocker, Phillip A., Water Quality Protection Division, Region 6 - Dallas,. United States Environmental Protection Agency. Containment Assessment of Patrick Bqyou. December 1996. 62 pages. (Appendix A)
6. U. S. Geological Survey, La Porte Quadrangle, Texas, 7.5 Minute Series. Topographic Map. Provisional Edition 1965. (Site location, I -mile radius, legend and map notations added by TNRCC). I page. (Figure 1).
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8. Texas Natural Resource Conservation Commission, The State of Texas Water Quality Inventory, Surface Water Quality Monitoring Program, 13<sup>th</sup> Edition, 1996, Volume 2 –Basin Summaries, Basin Maps, Graphical Basin Summaries, Segment Fact Sheets, and Water Quality Status Tables (Basins 1-10), SFR-50. December 1996. 758 pages.
9. U. S. Department of Commerce, Weather Bureau. Rainfall Frequency Atlas of the United States. Technical Paper No. 40. May 1961. 130 pages (Appendix C - 2-Year 24-Hour Rainfall in Inches, page C-6).